White Paper:
Development of Guidance on Updating Output Allowance System

Submitted By: FirstEnergy Corp.
On Behalf Of: Ohio Edison Company
Pennsylvania Power Company
The Cleveland Electric Illuminating Co.
Toledo Edison Company

Data Issues

1. What are sources of information that States need in order to determine and update allocations on a periodic basis?

Electrical Generation:

Where do plants measure electricity? (e.g., gross MWh measured at generator, net MWh determined at plant level from other measurements)

Electric utility power plants typically measure gross megawatt hour (MWh) output from the generator. In addition, power plant's internal or "auxiliary" power usage is measured using the same types of devices. The net of these two measurements is typically how plants determine net MWh output. In some cases, power plants actually measure net MWh output at the step-up transformer which connects to the transmission grid. This net measurement can be performed at the "low" or generator side or at the "high" or transmission side which will result in a lower measurement due to transformer losses.

What supporting records are needed for MWh (e.g., quality assurance test results on megawatt meters)?

Instrument transformers are tested and certified by the manufacturers and should require no additional QA/QC beyond the manufacturers certification. Modern solid-state meters should similarly require very minimal testing (see ANSI Standard No. C12.16) while older electromechanical or rotating meters require more frequent testing and calibration (see ANSI Standard No. C12.10).

What are the advantages and disadvantages of measuring net MWh?

The advantage of net MWh, the incentive created for plants to minimize internal electrical usage, is also its principal disadvantage. Various pollution control devices are significant electrical users at electric generating plants. Using net MWh penalizes those plants with environmental control devices such as scrubbers and SNCR or SCR. The other disadvantage is the potential complexity and expense of metering equipment to measure net output on those units where net generation meters are not currently installed.

What are the advantages and disadvantages of measuring gross MWh?

The principal advantage of measuring gross MWh is the simplicity of measuring the output at the generator. This is a comparable measurement that every commercial electric generating station can currently provide. However, plants are not rewarded in the allocation for minimizing internal electric usage.

Should power output be measured as gross generation at the generator or net generation after plant power requirements have been consumed?

FirstEnergy is still weighing the relative merits of both approaches and will also consider the views of the agency and other stakeholders.

Does gross generation fail to account for a plant's power requirements whose efficiency could be improved?

Yes but commercial incentives are driving efficiency improvements.

Can net generation be measured at the point of sale?

Yes if you define the "high" or transmission side of the step-up transformer as the "point of sale." Generator output is feed to a step-up transformer which elevates voltage to transmission levels and connects on the "high" voltage side to the grid. In a deregulated environment, this is likely to be considered the point of sale (essentially comparable to FOB shipping point).

Can all electric generating plants measure net generation at the same general location and with the same method?

Generally yes although slight variations will exist between plants or systems.

How can EPA allocate based on generation measured at the plant level or the generator or turbine level, when EPA's allowance tracking system tracks at the unit (boiler or turbine) level and EPA's emission tracking system tracks emissions and heat input at the unit and stack levels?

EPA can accomplish a unit level output-based allocation using either gross or net MWh output data. All electric power plants can provide unit level gross MWh output for an output-based allocation. A great majority of electric power plants have separate step-

up transformers for each unit which allows unit level measurement of net MWh output. The few plants with a single step-up transformer would have to allocate plant level net MWh output back to the unit-level based on gross output or other factors.

2. Equipment sources use to measure output

Is standard equipment available to measure power output?

Instrument transformers of two types--potential transformers and current transformers--and meters are the industry standard for measuring electrical output.

Does the measurement equipment vary based upon the source of energy? (e.g., is electricity measured the same way in a hydroelectric plant and a coal-fired unit?)

No.

Does the measurement equipment vary based upon the unit type or the generator/turbine type?

No.

What standard methods exist for ensuring the accuracy of output monitoring equipment (e.g., ASME or IEEE standards)?

For instrument transformers:

IEEE Standard No. 57.13
ANSI Standard No. C93.1

For meters:

ANSI Standard No. 12.10
ANSI Standard No. 12.16

Do sources typically use those accuracy standards?

Yes, and in a deregulated environment where the point of sale will likely be the interconnection between the powerplant and the grid, the market will demand accurate monitoring of net kWh output from each facility.

What is the typical error found in output measurements? Is the error different for steam and for electricity?

"Relay accuracy class" equipment measures electrical output with an accuracy of 2% or better. However, the utility industry has been and continues to upgrade to "revenue metering accuracy class" that measures electrical output with an accuracy of 1%

or better. Since there are three devices involved--potential transformer, current transformer and meter--which may have either a positive or negative error, the typical accuracy is much greater and often approaches 0.3% with “revenue accuracy metering class” equipment.